MultiSpec Practice Exercises

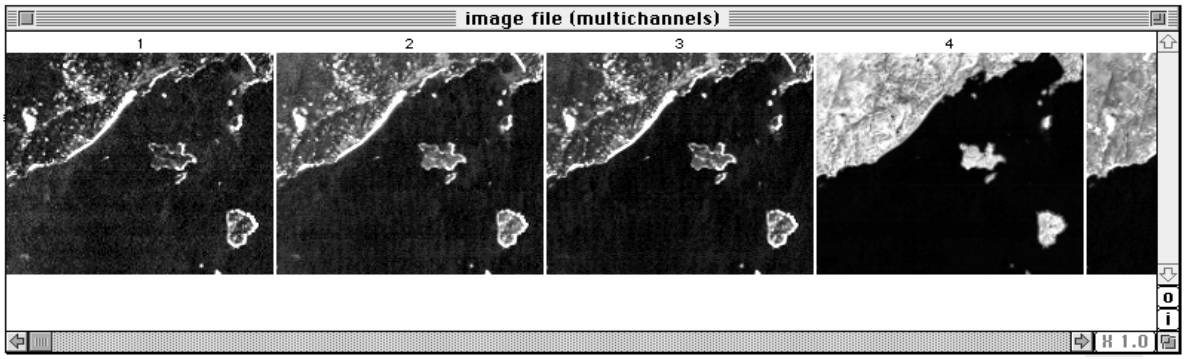
TM

Developed at the University of New Hampshire

Comparing the Five LandSat Channels

A. If you have already opened an image in side-by-side channels, skip to section "B" below. The following shows you how to open the Beverly, MA, image for this exercise.

- ❑ Launch MultiSpec
- ❑ From the **File** menu, select **Open Image**
- ❑ In the **Multispectral Display Specifications** dialog box, pull down the **Display Type** menu and select **Side by Side Channels**.
- ❑ You will see a grey-scale image with the number "1" above it.
- ❑ **Enlarge** the display window horizontally, and you will see that there are several different images of Beverly, as shown below. Each one represents the data for one of the LandSat channels, 1 - 5, that are included in a GLOBE image.



B. Examining the Channels

❑ **Scroll through the images**. The numbers above the images correspond to the channel numbers in the LandSat image..

1 = Blue
2 = Green
3 = Red
4 = Near Infrared
5 = Mid Infrared

❑ **Describe** how the appearance of each of the following varies from channel 1 through 5.

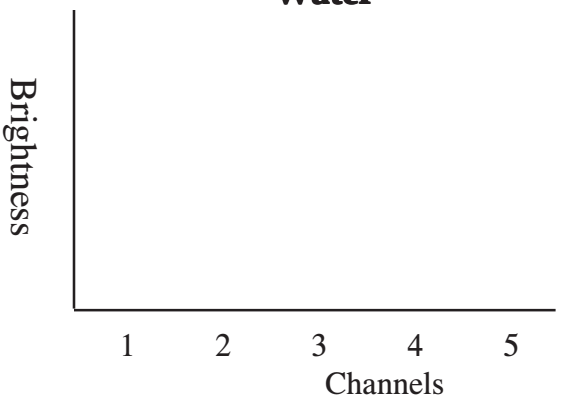
Water: _____

Urban Areas: _____

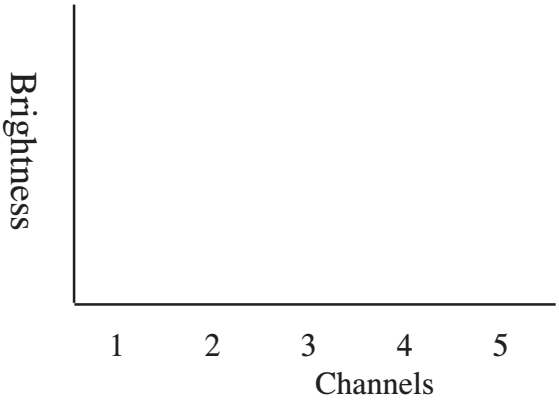
Vegetation: _____

If we could make a plot (a line graph) of how bright each of these different materials is in each channel, hypothesize on the charts below what each would look like.

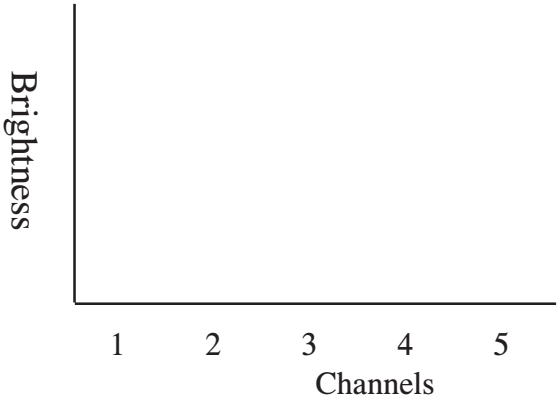
Water



Urban



Vegetation



MultiSpec "Trouble Shooting" Tips

Since MultiSpec was not designed as educational software, it is easy to "get lost." Here are some tips for the most common "traps."

- If you "lose" your image: You have probably clicked into the "**Text Output**" window. Go to **Windows** in the main menu bar, and you should find your image listed. Select it to return to the image.

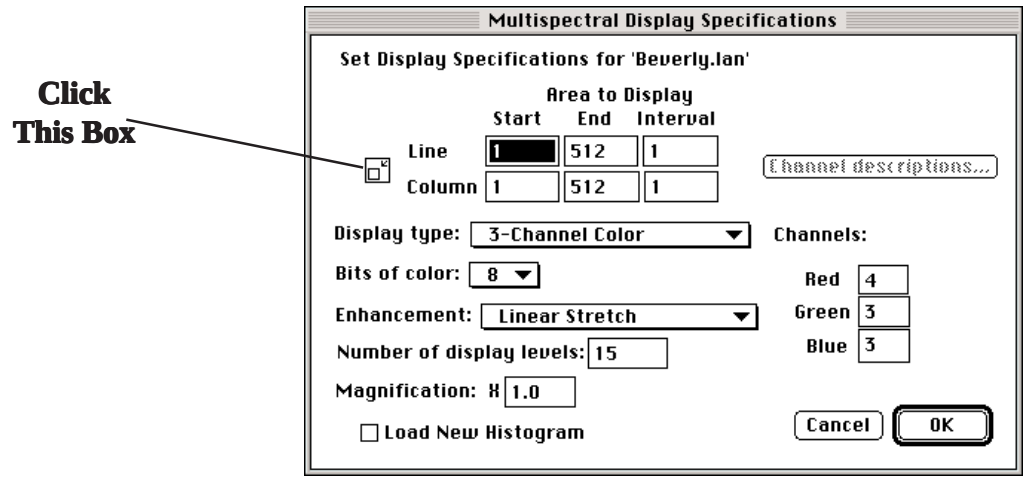
OR

- You have clicked entirely outside the MultiSpec operating window. The program is still running, you have just "left it." To remedy:

  Macintosh: Go to the "**Finder**" (Icon in the upper-right corner of the screen. Click and drag down to MultiSpec.)

  PC: Select **MultiSpec** from the program buttons at the bottom of your screen (WIN '95).

- If you end up with only a small part of your image: You probably clicked and dragged a box, then performed some other operation. Go to **Processor** --> **Display Image**. **Click** on the small box shown below, the display should show "512" in the **Line** and **Column** windows, click **0K** and you have your image back.



Practicing With Spectral Bands

The LandSat image provided by GLOBE contains 5 “channels,” or “bands” of spectral data covering the following portions of the electromagnetic spectrum:

Blue:	0.45 - 0.52 μ
Green:	0.52 - 0.60 μ
Red:	0.63 - 0.69 μ
Near Infrared:	0.76 - 0.90 μ
Mid Infrared:	1.55 - 1.75 μ

Since different kinds of surface features reflect energy to the satellite sensors in different amounts in each band, the appearance of surface features may be different in different band combinations. For each of the types of land cover shown in the table below, describe its color in each of the band combinations shown. Then, decide which combination, if any, is best for discriminating that land feature.

	RGB	**RGB**	**RGB**
	321	**432**	**542**
Beaches			
Highways			
Areas with Trees			
Open Water			
Urban Areas			

List below the band combinatin you think best delineates each of the areas:

Beaches:

Highways:

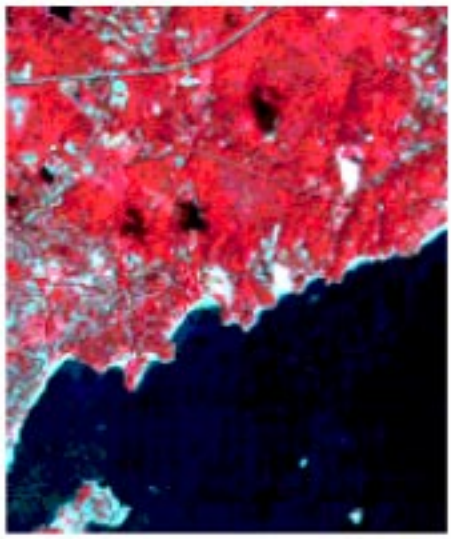
Areas with Trees

Open Water

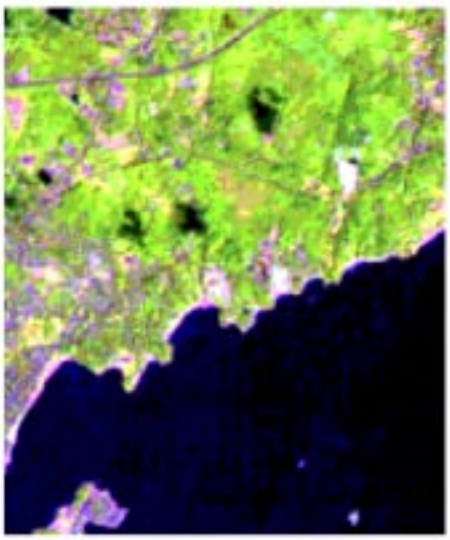
Urban Areas:

Band Combinations

3, 2, 1 -- "True Color" Shows approximately how Earth looks from space



4, 3, 2 -- "False Color Infra-red. Simulates an aerial infra-red photo.



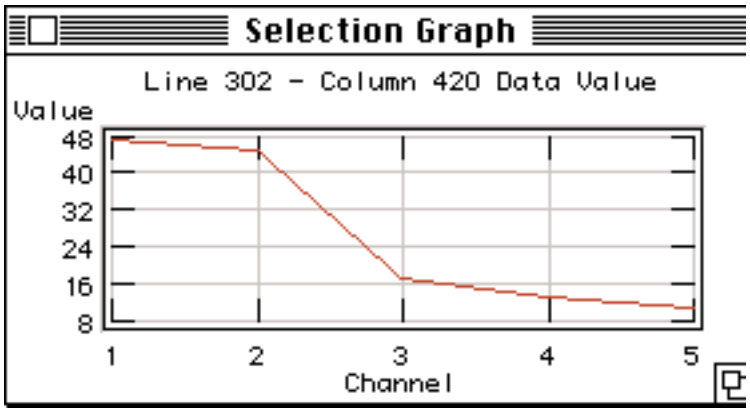
5, 4, 2 -- Useful in determining vegetation moisture content

Some Typical Spectral Patterns (Signatures)

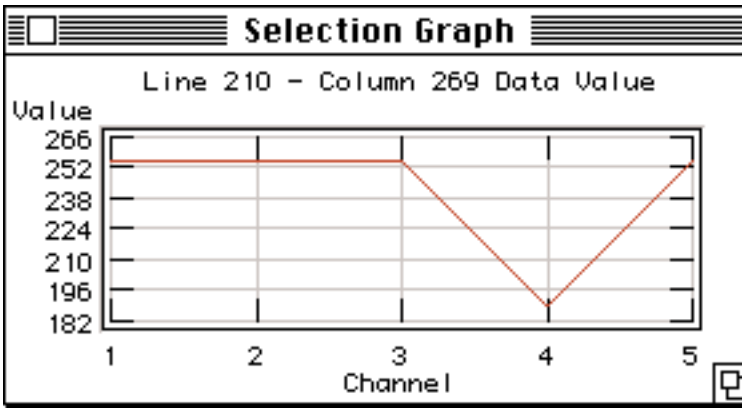
The following examples, taken from the Beverly, MA, image are representative of the spectral patterns found in images. Remember that different examples of similar land cover will vary somewhat.

Water

Water is usually dark. It absorbs much of the energy that strikes it. This is shown by the low **Value** scale. Remember that values may range from 0 - 255. Notice that water has very low reflectance in the Near and Mid-Infrared bands, channels 4 and 5. Water is an excellent Infrared absorber.



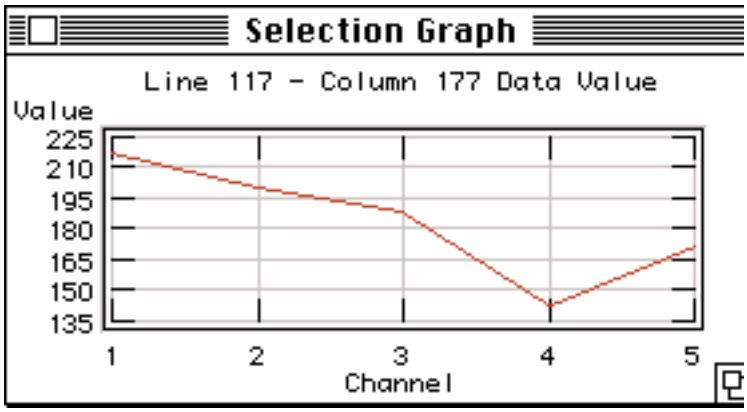
A Sandy Beach



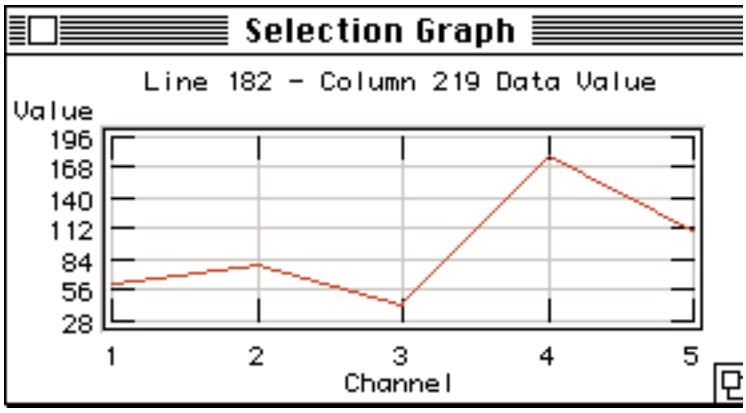
This strip of beach very strongly reflects back into space most of the energy (electromagnetic radiation) that strikes it (the readings for ch. 1, 2, 3 and 5 are 255...the sensors were “saturated.”) Notice that the beach does absorb some Near-Infrared radiation. This is why the sand gets so hot on this sunny day.

Urban

In this typical urban reflectance pattern, you can see a similarity to the beach pattern above. Both are **mineral** in composition, and have a similar pattern. Because the urban area is not as homogeneous as the beach, it’s pattern is not as uniform.



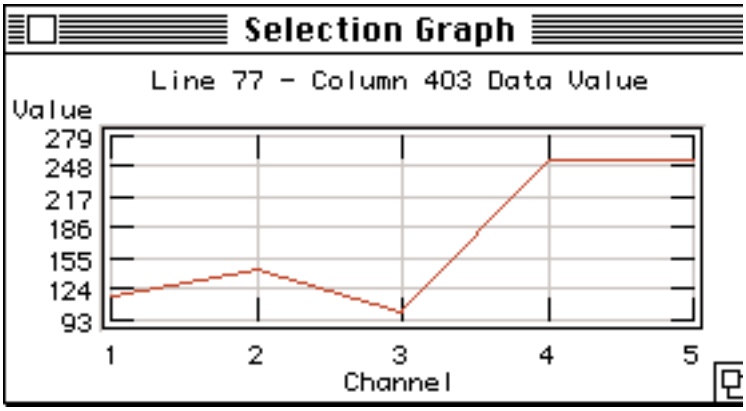
Vegetation



This is a typical spectral pattern for "normal," or healthy vegetation. Note that the visible bands have low reflectance; vegetation is dark to our eyes. There is a very high reflectance in the Near-Infrared; this is due to reflectance by "biomass" (chlorophyll.) The lower value for band 5, the Mid-Infrared, is due to absorption by water in the plant mass. The more water, the **lower** this reading.

Dry Vegetation

This is the pattern commonly seen in dry vegetation such as grasses, field crops (hay, etc.) It is similar to the pattern above, except in band 5, the Mid-Infrared channel. Because there is *less water* in the plant structure, less energy in this band is absorbed, so more is reflected back to the satellite sensor.



MultiSpec -- A Final Problem from Beverly

In this problem, you will be asked to identify two similar features, based on their spectral properties.

- ❑ Be certain that you have opened the coordinates window in MultiSpec.

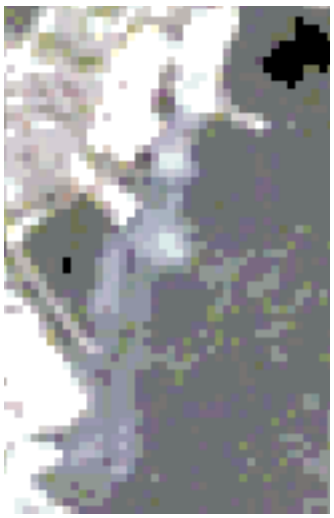
- ❑ In either version, from the **Options** menu, select "**Show Selection Coordinates**." The window that opens will give you the **Line** and **Column** location of the cursor and whatever point you "click" on.
  Remember that **lines**, running across the image, measure position **down** (Y) the image, and **columns**, running vertically, measure position **across** (X) the image. Position 1,1 is the top-left pixel.

The Features:

The features, which appear as "blue spots," are located in the lower-left part of the image, at the coordinates:

Point 1: Line = 383, Column = 105
Point 2: Line = 394, Column = 104

as shown to the right.



Hypothesis: Without examining the spectral patterns of these features, speculate as to their identities:

_____

Examine the spectral patterns of each:

a. By their shape, what do the spectral patterns suggest these areas are?_____

b. What problem do you see with your answer to "a"?_____